

March
2026

Ø BEAT

PIKES PEAK RADIO AMATEUR ASSOC.



ARRL frequency chart updated

In February, the FCC finalized its approval for amateur radio operators to use additional frequencies in the 60-meter band. 5.3515–5.3665 MHz replaces the previous “channel 3” allocation, and is no longer channelized. (The other four channels remain available to us, unchanged.)

The ARRL has updated its color frequency charts, so if you have one hanging in your shack, you might like to print out a fresh copy that shows the new frequencies available to us. And let's plan to put these new frequencies to use, as soon as we can cut antenna wires appropriately and open up the frequencies on our transmitters! See you on the new band!

What's Inside

- ARRL frequency chart updated
- Board Member Spotlight
- Free VE Sessions
- Knife Edge Diffraction
- Hands-on experimentation
- Megafest!
- Save the Date

Contact Zero Beat

Do you have photos of PPRAA events you'd like to share, or news from the ham radio world that the club might like to hear?

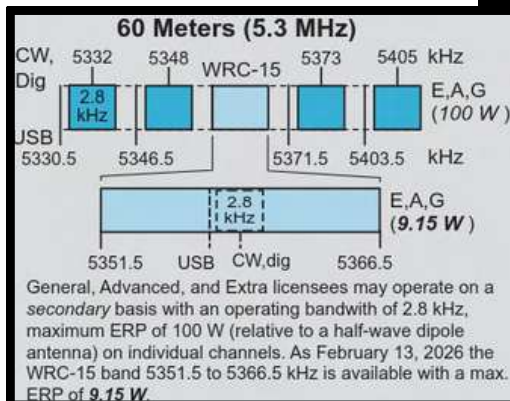
Please email

zerobeat@ppraa.org

MEGAFEST RAFFLE TICKETS ARE NOW AVAILABLE!

To buy or sell tickets
Contact Leianna N7ZOO
megafest@ppraa.org
or (719) 271-2961

**YOU
ARE THE KEY
TO SUCCESS!**



Download the updated charts:
<https://www.arrl.org/graphical-frequency-allocations>



Board Member Spotlight

Kristina Manley / KFORRD Secretary

I officially became a licensed amateur radio operator in September of 2024, after making a spontaneous decision to take the Technician exam in July of 2024—a decision that quickly turned into one of the most meaningful and rewarding paths I've taken.

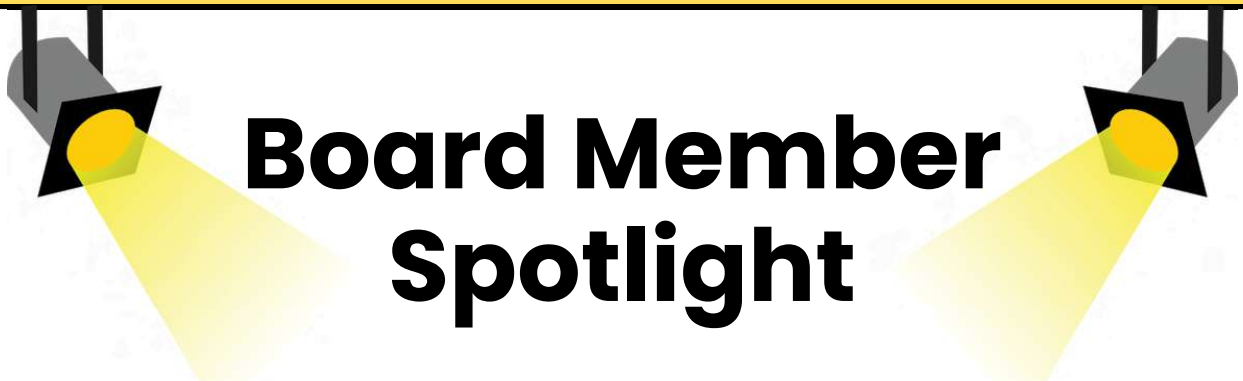
What began as a whim soon grew into a deep passion for communication, service, and community connection. As I continued learning, I realized just how powerful amateur radio is—not only as a technical hobby, but as a lifeline during emergencies and a way to bring people together. I worked my way up to General Class, and my next goal is to earn my Extra Class license by the end of 2026. Each step has challenged me to learn new skills, expand my technical knowledge, and push myself far beyond what I originally expected.



One of my favorite parts of ham radio has been the constant opportunity to learn. From understanding propagation and antennas to practicing net operations and emergency communications, no two days feel the same. I enjoy asking questions, experimenting, and continuing to grow as an operator. Ham radio has truly been an ongoing adventure in problem-solving and lifelong learning.

I am deeply involved in emergency communications through my church's emergency radio programming, where I help support preparedness efforts and run a monthly emergency preparedness net.

continued pg. 3



Board Member Spotlight

Board Member Spotlight cont..

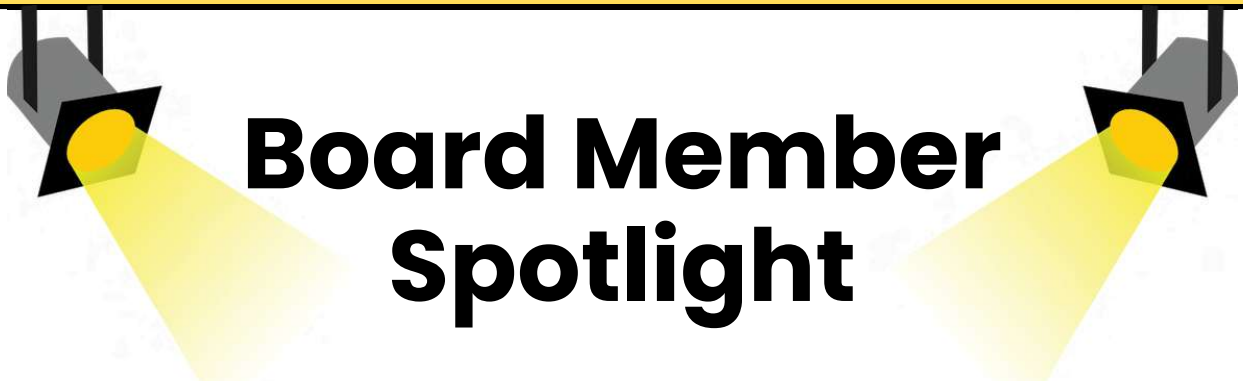
This role has strengthened my confidence as a net control operator and reinforced the importance of clear, calm, and organized communication—especially when others are relying on it. Serving in this capacity has shown me firsthand how amateur radio can provide stability, reassurance, and connection during uncertain times.

In 2023, I moved back to Colorado Springs, and since then my focus on emergency preparedness and community resilience has grown significantly. I teach in-person emergency preparedness classes, covering practical, realistic steps families can take to be ready for disasters common to our region. I am also developing my own preparedness curriculum, designed to break large, overwhelming topics into manageable weekly actions.

Amateur radio plays a central role in that curriculum, because communication is often the first thing lost during an emergency—and one of the most critical things to restore.

Outside of radio, I am also pursuing a Master's degree in Early Childhood Education, which may seem unrelated at first, but actually complements my emergency preparedness work beautifully. Both roles focus on education, leadership, planning, and supporting others—whether that's children, families, or communities. Balancing graduate school, radio service, curriculum development, and leadership roles means I keep a very full plate, but I genuinely thrive on staying busy and purposeful.





Board Member Spotlight

Board Member Spotlight cont..

Amateur radio has given me far more than a license or a callsign—it has given me community, confidence, and a sense of service beyond myself. Through PPRAA, I've found mentorship, friendship, and encouragement that continues to shape my journey as an operator. I'm grateful to be part of a club that values learning, public service, and supporting one another.

As I continue working toward my Extra license and expanding my involvement in emergency communications, my goal is to help more people understand that amateur radio is accessible, practical, and incredibly empowering. Whether through club service, preparedness education, or community outreach, I look forward to continuing this journey—one transmission at a time.



FREE Radio Licensing Test Sessions
Second Saturday of every month
Testing begins at 10 am
Please arrive by 9:30 am
to get signed in and get instructions.
Location: Pikes Peak Regional
Office of Emergency Management
3755 Mark Dabbling Blvd.
Colorado Springs, CO 80907
ve@ppraa.org

Almost Forgotten Amateur Radio Concepts and Theories

by Paul Wilkinson / K6IG

Knife Edge Diffraction: Principles and Applications

Introduction

Knife-edge diffraction is a phenomenon that occurs when a wave encounters a sharp obstacle or edge and bends around it. This effect is significant in many fields, including radio wave propagation, optics, and acoustics. Understanding knife-edge diffraction is crucial for predicting and managing wave behavior in scenarios such as wireless communication, satellite transmission, and sound wave applications.

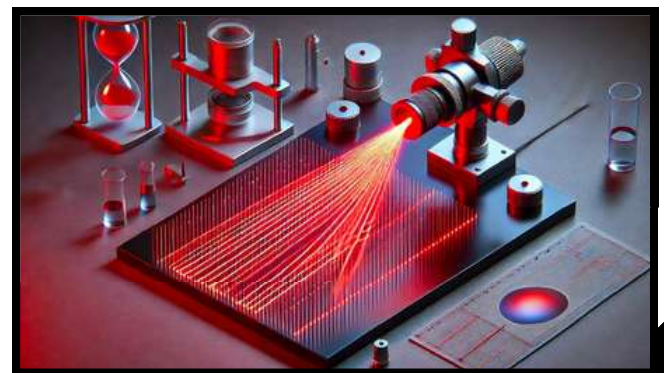
What is Diffraction?

Diffraction is the bending of waves around obstacles or through openings. When a wave, such as light, sound, or radio waves, passes through a small aperture or encounters an edge, it spreads out instead of continuing in a straight line.

This behavior is due to the wave-like nature of light, which allows for interference patterns where waves overlap.

Diffraction Pattern Example

The first image demonstrates a diffraction pattern created by a red laser passing through a single slit. As the coherent red light passes through the narrow slit, it spreads out, forming an interference pattern of alternating bright and dark fringes. These fringes occur because of constructive and destructive interference of the light waves.



continued pg. 6

Almost Forgotten Amateur Radio Concepts and Theories

Knife Edge Diffraction: Principles and Applications cont.

How the Cold War Influenced the Study of Knife Edge Diffraction

During the Cold War, radio communication became a critical asset for military and intelligence operations. The necessity for reliable communication in rugged terrains and across borders led to a deeper understanding of radio wave behavior, including knife-edge diffraction. Defense agencies and amateur radio enthusiasts alike invested in studying how radio signals could diffract over mountains and buildings, maintaining communication even without a direct line of sight.

Knife Edge Diffraction in Disaster Communications

Knife-edge diffraction is particularly valuable in disaster communications where infrastructure might be damaged or obstructed. When a natural disaster such as an earthquake or hurricane creates

physical barriers or disrupts line-of-sight communications, radio operators can use knife-edge diffraction to maintain emergency communication links.

By positioning antennas strategically, radio signals can diffract over debris or natural obstacles, ensuring that vital messages reach rescue teams and affected communities.

Mathematical Models for Knife Edge Diffraction

The diffraction loss for a single knife edge can be estimated using the Fresnel-Kirchhoff diffraction parameter (v):

$$v = h \sqrt{(2/\lambda) (1/d_1 + 1/d_2)}$$

Where:

- h = Height of the obstacle above the line of sight (meters)
- λ = Wavelength of the signal (meters)
- d_1 and d_2 = Distances from the transmitter and receiver to the obstacle (meters)

continued pg. 7

Almost Forgotten Amateur Radio Concepts and Theories

Knife Edge Diffraction: Principles and Applications cont.



Packet Radio and WinLink in Emergency Communications with Knife Edge Diffraction

Packet radio and WinLink are powerful tools in emergency communications, particularly when combined with the principles of knife-edge diffraction. Packet radio allows digital data transmission over amateur radio frequencies, providing a reliable method to send messages, files, and forms even when traditional communication infrastructure is compromised. WinLink extends this capability by offering email over radio frequencies, connecting remote or isolated areas with the broader internet or emergency networks.

When physical obstacles like mountains or urban structures obstruct direct communication, knife-edge diffraction enables radio signals to bend around these barriers, maintaining a crucial communication link. This combination ensures that emergency responders and affected communities remain connected, enhancing coordination and the delivery of aid during disasters.

Example: Communication at 441.100 MHz

For a frequency of 441.100 MHz, the wavelength (λ) is calculated using the formula:

$$\lambda = c / f$$

Where:

- c = Speed of light (3×10^8 m/s)
- f = Frequency (441.100×10^6 Hz)

continued pg. 8

Page

7

Almost Forgotten Amateur Radio Concepts and Theories

Knife Edge Diffraction: Principles and Applications cont.

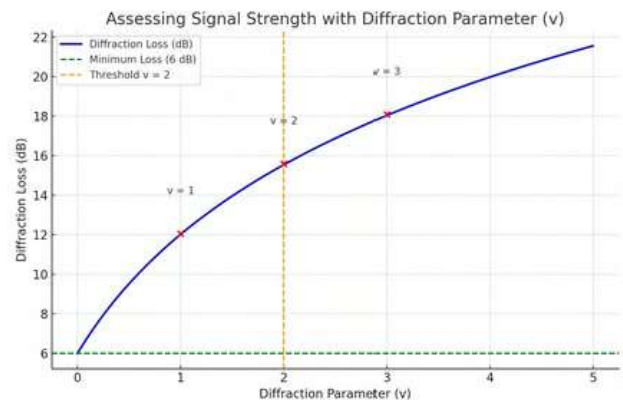
The wavelength (λ) is approximately 0.68 meters. Assuming two mobile amateur radio stations are separated by a mountain peak, the calculation involves determining the diffraction parameter (v) and using it to calculate the signal strength.

$$v = 200 \sqrt{(2/0.68 (1/5000 + 1/3000))}$$

The resulting diffraction parameter (v) can then be used with diffraction curves or empirical models to assess whether the signal can effectively reach the receiving station.

Assessing Signal Strength with Diffraction Parameter (v)

The next diagram shows how the diffraction parameter (v) is used with diffraction curves to assess whether the signal can effectively reach the receiving station. Key points on the curve are highlighted to show specific values of v and their corresponding signal loss.



Practical Applications of Knife Edge Diffraction

1. Wireless Communication: Maintaining signals in urban environments with many obstacles.
2. Satellite Communication: Predicting signal strength when obstructions exist between the satellite and ground station.
3. Optics: Explaining diffraction patterns seen in light experiments with edges.
4. Acoustics: Understanding sound propagation in concert halls or outdoor environments.

Almost Forgotten Amateur Radio Concepts and Theories

Knife Edge Diffraction: Principles and Applications cont.

Practical Applications of Knife Edge Diffraction cont.

5. Disaster Communications: Using diffraction to maintain emergency communication when debris or natural obstacles block direct lines of sight.
6. Amateur Radio: Enhancing signal range and overcoming geographical obstructions, especially during the Cold War era

Conclusion

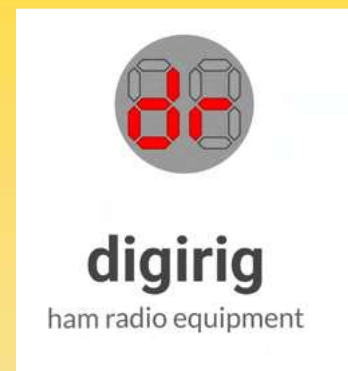
Knife-edge diffraction is a critical wave phenomenon that enables effective transmission and reception of waves in obstructed environments. By leveraging the principles of diffraction, engineers and scientists can design systems that maintain robust communications and wave propagation even in challenging scenarios. Understanding this effect can lead to innovations in wireless technology, acoustic design, and beyond.

PPRAA Megafest 2026 Sponsors!



ARRL

Sanctioned
Hamfest



For more information visit
[PPRAA.org/megafest](https://ppraa.org/megafest)
Contact megafest@ppraa.org
or call Leianna N7ZOO (719) 271-2961

Hands-on experimentation with PPRAA

Amateur radio operators study for their licensing tests in different ways: some of us read study-guide books, some of us watch videos online, and some of us do memory drills with flash cards. But many of us seem to enjoy the hands-on experimentation after the tests have been passed. This is called being a "kinesthetic learner," and some recent on-air activities facilitated by PPRAA gave us a great opportunity to learn about the FreeDV mode that was covered in last month's Zero Beat.

Twelve participants met on Zoom one evening in February to check our set-ups with our computers talking to our radios and the FreeDV software, with the RADE v1 codec, doing the modulation. Through several guided activities, we tested this digital voice mode in real-world-style exercises.

One such experiment was to have each station starting with 80 watts output, talking over the air, then

reducing power to 40 watts, 20, 10, and 5, with receiving stations making note of the received signal-to-noise ratio on the FreeDV software's meter. I (LD/W0XLD) took note of the following stations that were within my range of reception:

- Eric/K9EAJ: 12 dB, 6 dB, 4 dB, 1 dB, -3 dB
- Ben/AB2SG: 15 dB, 10 dB, 7 dB, 6 dB, 2 dB
- Doug/N7LEM: 20 dB, 16 dB, 11 dB, 8 dB, 3 dB

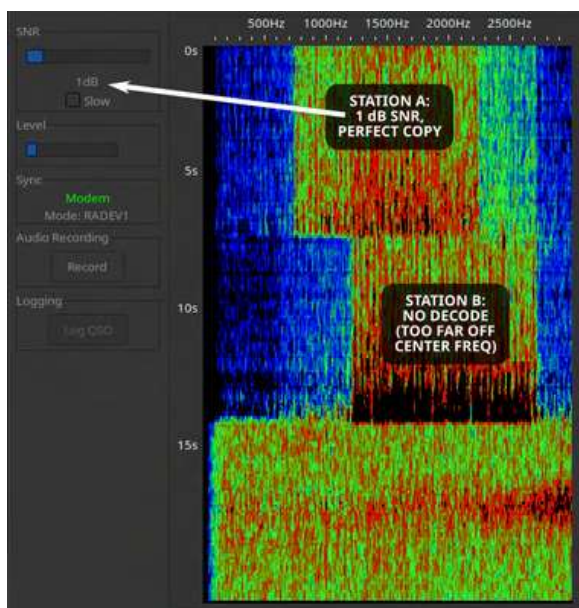
One thing that stands out is that all three transmitting stations came pretty close to modeling expected behavior: halving their output in watts produced approximately a 3 dB reduction in SNR. The software can demodulate successfully down to -2 or -3 dB, so I was able to get solid copy on at least these three transmitting stations all the way down to 5 watts.

The next activity was to ascertain how it performs in pile-ups and during doubles.

continued pg. 11

Hands-on experimentation with PPRAA cont.

We assigned one station to start talking, another station to wait a few seconds and then start talking on top of the first. Though I had had poor results with doubles in other bands, ground wave conditions on ten meters gave us a more controlled test environment. I continued to receive and correctly decode the first transmitter, even after the second station keyed up, and even if the second station was running a few extra watts! The first station took a big SNR hit, but not enough to cause the decoder to lose lock if I had enough margin to start with. So it might be useful even in field day and contesting situations if we just roll with whichever the decoder can lock onto first: more testing in this area might be fun.



Another activity we experimented with was decoder selectivity. A FreeDV/RADE carrier is 1.5 kHz wide. Can the decoder differentiate between two signals right next to each other on the spectrum? Is a guard band required? What about if they even overlap a little? We assigned dial frequencies 1.5 kHz apart from each other to two known-good transmitting stations, set to the same power output, then reduced spacing to 1 kHz, then to 0.5 kHz. SNRs were recorded as follows:

- 1.5 kHz spacing: station A, 12 dB; station B, 6 dB
- 1.0 kHz spacing: station A, 6 dB; station B, -3 dB
- 0.5 kHz spacing: station A, 3 dB; station B, no lock.

These results showed FreeDV has excellent selectivity when there is no overlap, but as with our pile-up experiment, the SNR drops quickly when there's overlap. However, the overlap did not cause any extra latency in getting a signal lock as long as the power levels were sufficient. So if we're ever short on bandwidth and long on power, two FreeDV stations can "share" as little as 2 kHz!

Hands-on experimentation with PPRAA cont.

We had a few other activities, like testing on the two-meter band, but even those for whom ground-wave propagation was not conducive to group activities got to test their setups, check for configuration issues, and try contacts on other bands.

PPRAA would like to thank all the participants who helped make these experiments possible, and encourage everyone to get involved in our on-air experiments to come. Check the schedule on our website, <https://ppraa.org>, and see announcements for future events right here in Zero Beat.



Vendors Wanted! Apply Now!

 **8:00am – 1:00pm**
July 25, 2026

 **Lewis-Palmer High School**
Monument, CO

PPRAA
AMATEUR RADIO
MEGAFEST
2026

ARRL
Sanctioned
Hamfest

<https://www.ppra.org/megafest>



Mark Your Calendar



General Membership meeting (8 APR 2026)

Location: Golden Corral
1970 Waynoka Rd, Colorado Springs

The business meeting starts at 7 PM, but you may get your dinner and beverage of choice and check in any time after 6 PM for a social hour. Club members check your email for info or email Officers@PPRAA.org to receive the Zoom information.



PPRAA Thursday 10m & 2m Nets -

- (28.390MHz SSB at 1900 MDT)
- (147.345+MHz, 107.2ctcss at 2000 MDT)

Thursdays- Weekly Elmer Breakfast -

Village Inn, 535 Garden of the Gods Rd.
Meet between 0730-0800

World Amateur Radio Day

- Saturday, April 18, 2026
- Radio amateurs worldwide take to the airwaves in celebration of World Amateur Radio Day. It was on this day in 1925 that the International Amateur Radio Union was formed in Paris

LARCFest 2026

- Saturday, April 4, 2026 (0900-1300)
- Boulder County fairgrounds
- Longmont, Colorado